

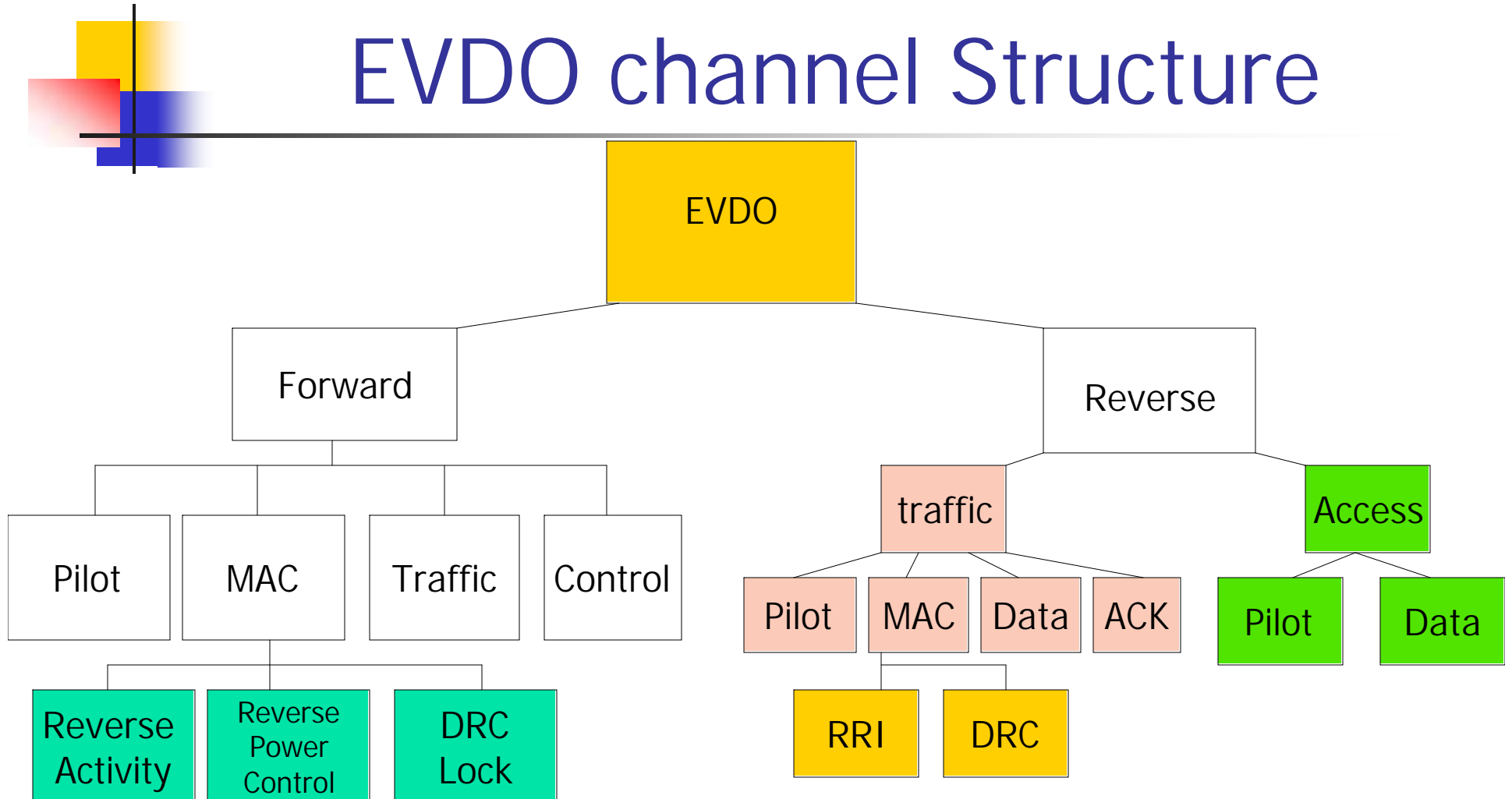


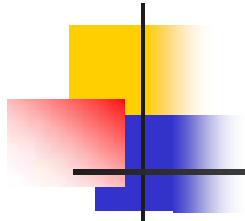
# Overview of EVDO RL and FL channel Structure and quick survey of TIA 856-A-1

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# EVDO channel Structure

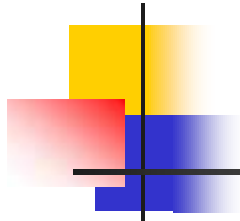




# Summary of EVDO RL

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- In RL: Traffic channel consists of 4 CDM channels:
  - 1. Pilot Channel
  - 2. MAC channel [Reverse Rate Indicator Channel // Data Rate Control Channel]
  - 3. Data
  - 4. ACK channel



# Summary of EVDO FL

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- FL consists of the following [1/2 slot = 1024 chips]:
- Data channel 400 chips
- MAC 64 chips
- Pilot 96 chips
- MAC 64 chips
- Data 400 chips
- 16 slots constitute a Frame = 26.66 ms
- 16 frames make a super frame with 1 control channel cycle [426.66 ms]
- MAC channel has the following sub-channels:
  - RA channel = Reverse Activity channel [RAB]
  - RPC = Reverse Power Control Channel
  - DRCLock Channel
  - FL Control Channel = Sync and paging channels [once every 256 slots]

# EVDO Reverse Link Channel Structure and definitions



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- The following few slides refer to the relevant sections in TIA 856-A-1:
  - Section 13.2.1.3.1 Reverse Channel Structure (pages 13-11, 13-12)
  - Figures 13.2.1.3.1-1 (13-13 up to 13-16) {figures are gobbled up in the document}.
  - Figure 13.2.1.3.1.6 Multi-slot physical packet with normal termination (Shows how DRC and ACK channels are code-multiplexed in RL)
  - Table 13.2.1.3.1.1-1 Modulation parameters for the Access Channel and the Reverse Traffic Channel [Note the code rates  $\frac{1}{4}$  and  $\frac{1}{2}$ ]
  - Figure 13.2.1.3.2.1 Example of Access Probe transmitted at 9.6 kbps [data and pilot are IQ multiplexed]

# EVDO Reverse Link Channel Structure and definitions



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- Section 13.2.1.3.1.2 Data rates [page 13-18]
  - Access Channel subtype 0 [9.6 kbps, code rate of  $\frac{1}{4}$ ]
  - Access Channel subtype 1 [9.6, 19.2, 38.4 kbps, code rate of  $\frac{1}{4}$ ]
  - Traffic Channel [9.6, 19.2 38.4, 76.8 kbps and code rate of  $\frac{1}{4}$ ]
  - Traffic Channel [153.6 kbps and code rate of  $\frac{1}{2}$ ]
- 13.2.1.3.3 Reverse Traffic Channel [definition of the channel]
- 13.2.1.3.2.1 Pilot channel [time multiplexed with RRI]
- 13.2.1.3.3.2 Reverse Rate Indicator channel [RRI channel]
  - Table 13.2.1.3.3.2-1 RRI symbol and simplex encoder assignments // RRI coding at  $\frac{3}{7}$
- 13.2.1.3.3.3 Data Rate of the Control Channel
  - Table 13.2.1.3.3.3-1 DRC bi-orthogonal coding // Rate  $\frac{3}{8}$
- 13.2.1.3.3.4 ACK channel
- 13.2.1.3.4 Data Channel

# EVDO Reverse Link Code Channel Summary

| Channel Type | Physical channel | Walsh Code | Long Code                        | Comment  |
|--------------|------------------|------------|----------------------------------|--|
| Access       | Pilot            | W(16-0)    | Access Long PN offset            | Pilot and data are code-multiplexed [IQ multiplexed] |
| Access       | Data             | W (4-2)    | Access Long PN offset            | Pilot and data are code-multiplexed [IQ MUXed]       |
| Traffic      | Pilot            | W (16-0)   | Public or private Long PN offset | Pilot and RRI are time multiplexed                   |
| Traffic      | RRI              | W (16-0)   | Public or private Long PN offset | Pilot and RRI are time multiplexed                   |
| Traffic      | MAC DRC          | W(16: 0-7) | Public or private Long PN offset | MAC DRC, ACK and Data are code multiplexed in RL     |
| Traffic      | ACK              | W (8-4)    | Public or private Long PN offset | MAC DRC, ACK and Data are code multiplexed in RL     |
| Traffic      | Data             | W (4-2)    | Public or private Long PN offset | MAC DRC, ACK and Data are code multiplexed in RL     |

# EVDO Reverse Link Channel definitions



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- Access Channel: The access pilot is used as a preamble during access probe
- Access Channel: Data channel is used to transmit mobile requests
- Traffic Channel: Pilot : Pilot during traffic allows synchronous detection and also carries RRI channel
- Traffic Channel: RRI reverse rate indicator: tells the AP the AT's desired rate for the reverse link data channel [part of data rate determination process]
  - It signals 8 desired rates
  - 8-ary orthogonal code is used to indicate rates
  - RRI symbol is transmitted 32 times in each frame
- Traffic Channel: DRC Data Rate Control Channel: Asks a specific sector to transmit to the AT at a specific rate.
  - Data rate is requested using 8-ary bi-orthogonal coding
  - Desired sector is requested using 8-ary Walsh cover code
- Traffic Channel: ACK channel: part of HARQ
- Traffic Channel: Data: Transmit the user data

# Summary of EVDO RL multiplexing structure

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- Pilot and data on Access Channel are IQ multiplexed
- Pilot and RRI on Traffic Channel are Time multiplexed [TDM]
- MAC DRC, ACK, Data and Pilot/RRI are Code multiplexed [CDM]
- Access and Traffic Channel are Code multiplexed [CDM]

# EVDO Forward Link Channel References



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- Section 13.3 [Access Network requirements] of Pilot, MAC and Data
- Section 13.3.1.3.1 (13-42) Forward Channel Structure
  - Figure 13.3.1.3.1.1-1
    - Each slot is time multiplexing
    - Figure 13.3.1.3.1.1-2 Forward Link Slot Structure
- Table 13.3.1.3.1.1-1 modulation parameters for the forward traffic channel and the control channel (part 1 of 2)
- Table 13.3.1.3.1.1-2 modulation parameters for the forward traffic channel and the control channel (part 2 of 2)
  - 1/3 and 1/5 code rates (control plus the traffic channels)
- Table 13.3.1.3.1.1-3 Modulation parameters for the MAC channel (RPC Channel, DRCLock Channel, RA Channel]
- Section 13.3.1.3.1.2 data rates
  - Forward Traffic Channel [76.8 kbps to 2.4576 Mbps] Code rates of 1/3 and 1/5
  - Control Channel: Data rates of 38.4 and 76.8 kbps [Code rate of 1/5]

# EVDO Forward Link Channel Definition References



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- 13.3.1.3.2.2 Forward MAC Channel
- 13.3.1.3.2.2.1 Reverse Power Control Channel
- 13.3.1.3.2.2.2 DRCLock Channel
  - Figure 13.3.1.3.2.2.2-1 DRCLock puncturing example: Time multiplexing of RPC and DRCLock Channels
- 13.3.1.3.2.2.3 Reverse Activity Channel
- 13.3.1.3.2.3 Forward Traffic Channel
- 13.3.1.3.2.4 Control Channel [broadcast messages as well as AT directed messages]

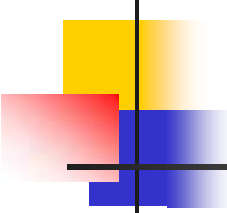
# EVDO Forward Link Channel Multiplexing References



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- 13.3.1.3.3 TDM
- Figure 13.3.1.3.3-1

# EVDO Forward Link Channel Definitions



| Channel Type | Physical Channel | Walsh Code | Short PN Code                | comment |
|--------------|------------------|------------|------------------------------|---------|
| Pilot        | Pilot            | W64 (0)    | Sector has a short PN offset | TDM     |
| MAC          | Reverse Activity | W 64 (2)   | Sector has a short PN offset | TDM     |
| MAC          | DRCLock          | W64 (MAC)  | Sector has a short PN offset | TDM     |
| MAC          | RPC              | W64 (MAC)  | Sector has a short PN offset | TDM     |
| Control      | Control          | W16 (x)    | Sector has a short PN offset | TDM     |
| Traffic      | Data             | W16 (x)    | Sector has a short PN offset | TDM     |

# EVDO Forward Link Channel Definitions



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- TDM
  - Constant power
  - Full power for Pilot and MAC
  - MAC, Pilot, Control and Data are time multiplexed
- Variable Data Rate: (38.4 kbps-2.46 Mbps)
- DRC reported by AT based on SNR measurement of the FL pilot
- AN must follow the DRC
- Variable Rate CDMA
  - User rate = 9.6 kbps-153.6 kbps

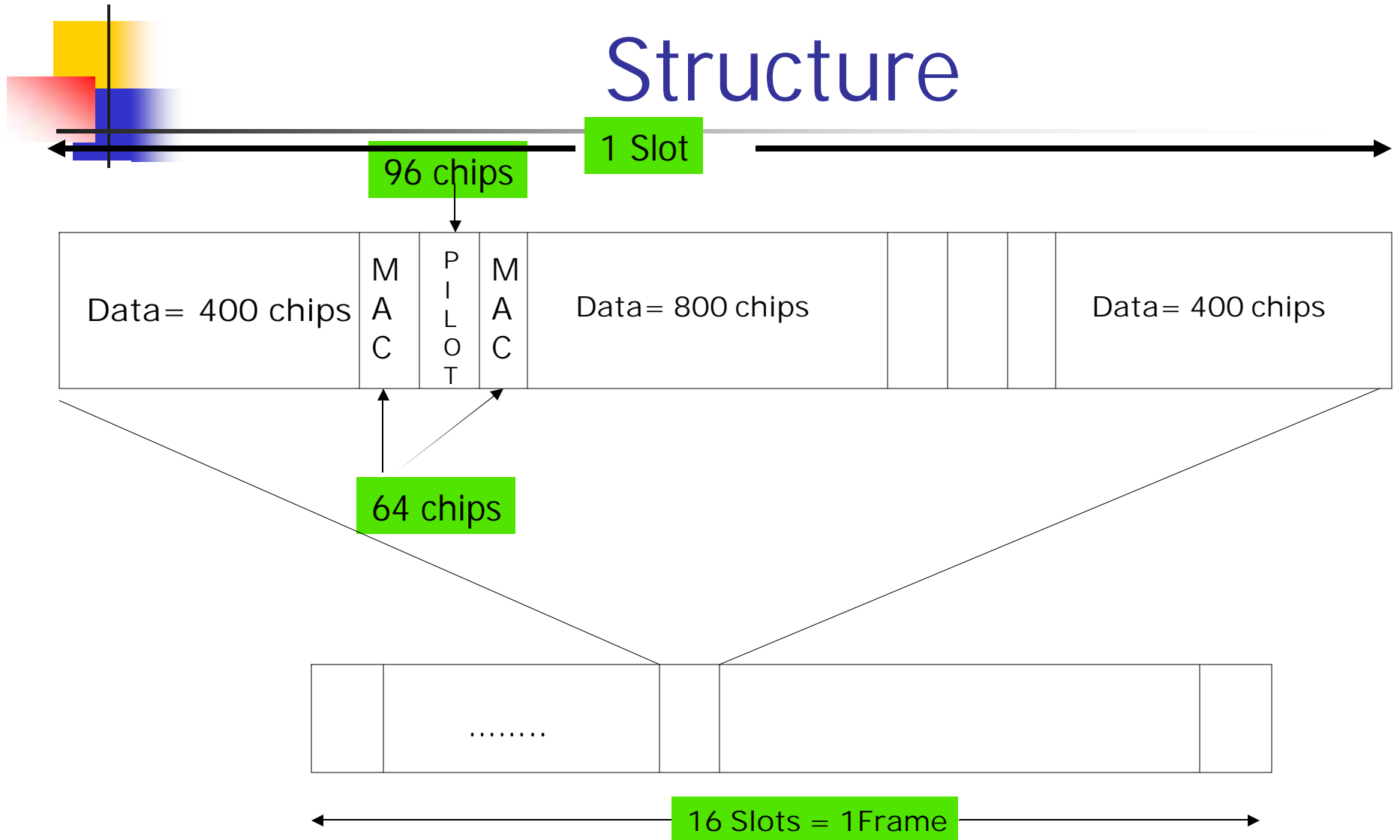
# EVDO Forward Link Channel Definitions



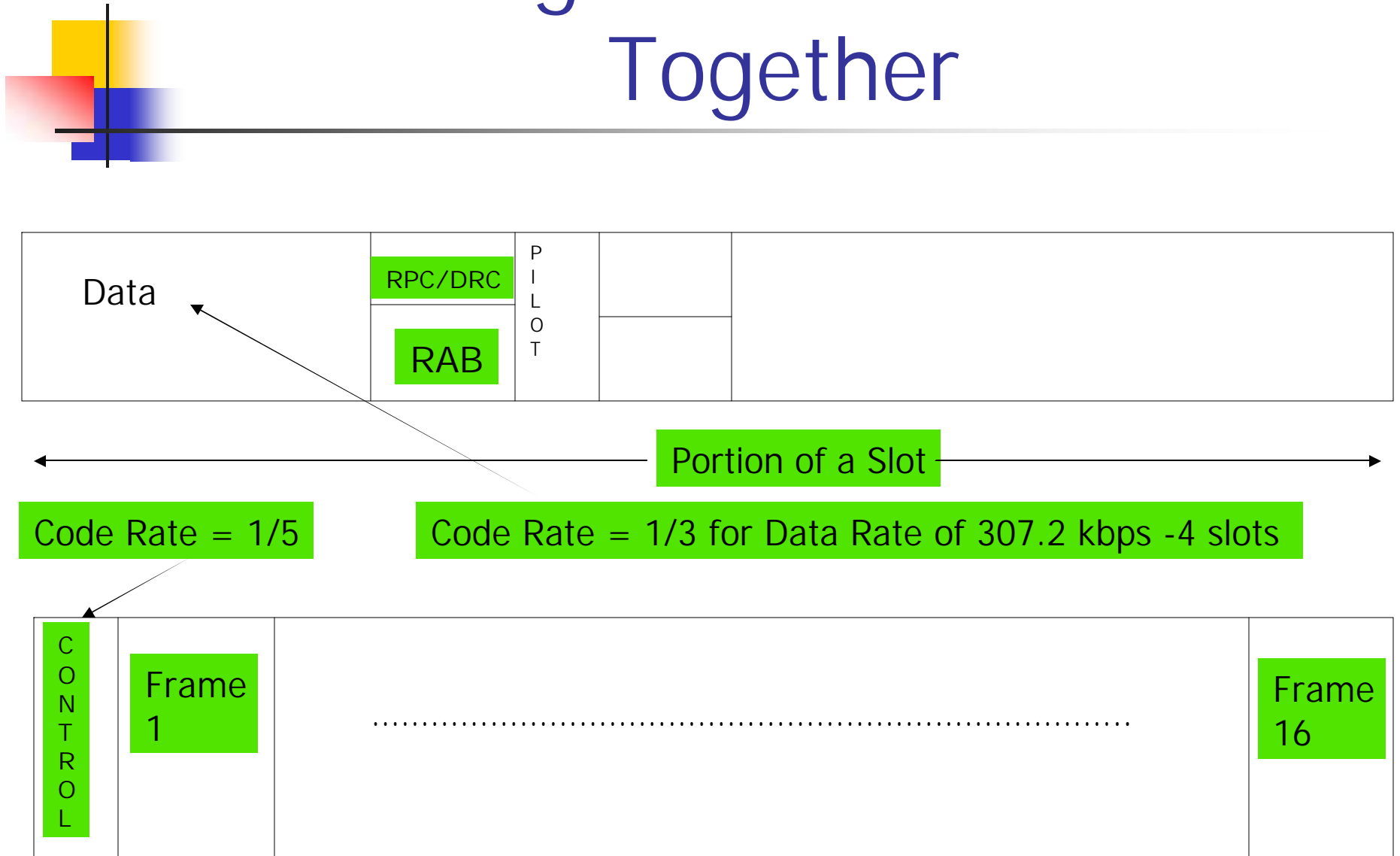
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- Rate Control
  - Reverse Activity bit (RAB)
  - Rate Limit message
- Power Control
  - RPC bit in MAC channel
- Frame = 26.66 ms and consists of 16 slots
- Each Slot is 1.66 ms
- 16 slots form a Frame
- 16 Frames form a Control Channel Cycle

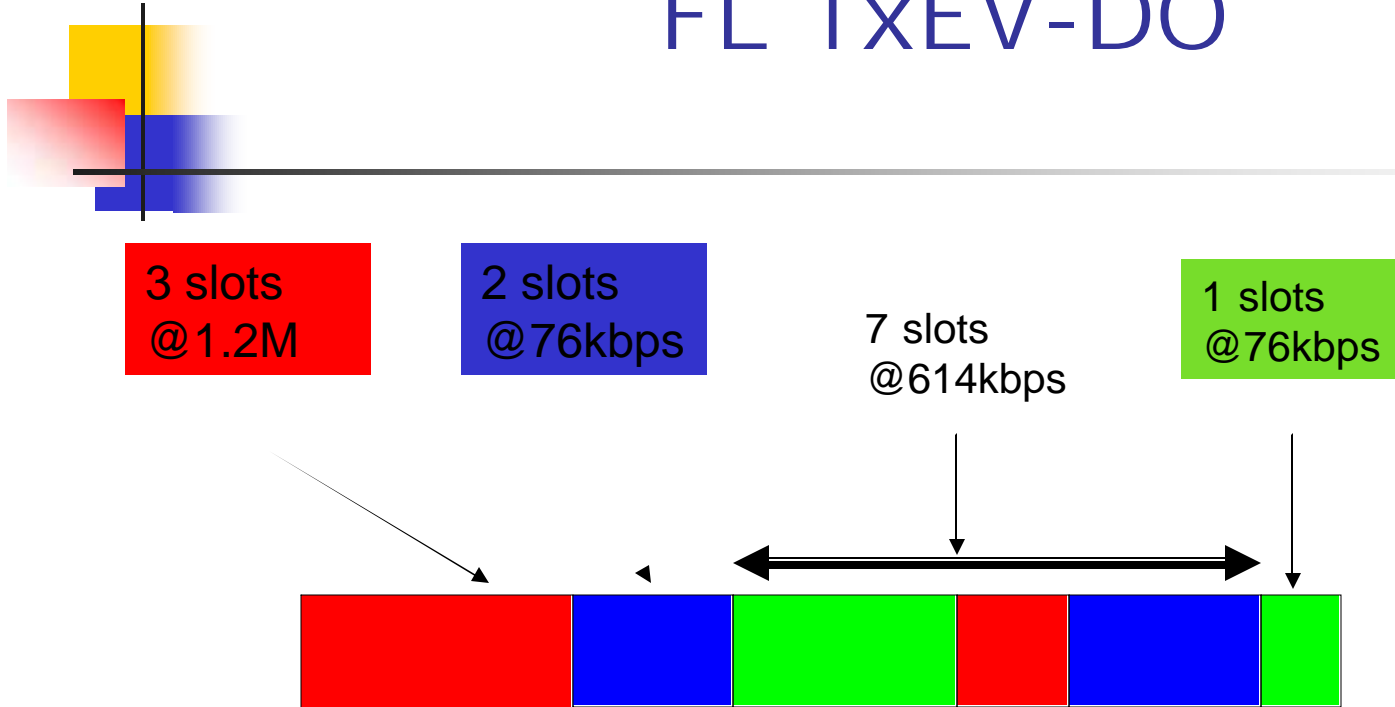
# EVDO Forward Link Slot Structure



# Putting the Forward Link Together



# FL 1xEV-DO



Ave. Aggregate Throughput = 594 kbps